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(54) Title: A PAY-PER USE SYSTEM OVER A SERIAL BUS

(57) Abstract: A local area pay-per-use system comprises user nodes coupled together via a local network, each user node receiving a program content selectable from a menu of program contents. A source node is coupled to said user nodes to provide the selectable program contents contained within a signal stream transmitted to each of the user nodes. An accounting module is coupled to the local area pay-per-use system, and is configured to track usage of the selectable program contents by each one of the user nodes. The user nodes include a variety of media systems, such as a televison, a personal computer, an MP3 format digital audio recorder, and a digital video arcade, and the like. Furthermore, a decoding key module is configured to store a plurality of decryption keys corresponding to each one of the program contents contained in the transmitted signal stream, and is provided to a user node upon request.

A pay-per use system over a serial bus

FIELD OF THE INVENTION

This invention relates to a digital pay-per use network system and, more specifically, to a local digital pay-per-use network system that is capable of operating many nodes in an independent arrangement.

BACKGROUND OF THE INVENTION

Many systems for in-home pay-per-view are available on the market. Most of these systems employ a set-top box containing a user interface protocol of some kind. The user enters information which is relayed back to the source of the signal, such as a signal source, station, an intermediate or local distribution center or a signal stored in a smart card. In the case of a smart card, it may give authorization to decrypt, and at a later date transmit billing information to a central station. At the signal source, the end user's request is accounted for, and the proper encoded signal is sent to the end user via a cable line or by satellite. The return signal is processed and decoded by the end user's set-top box and is then displayed over the screen.

Typically, with the arrangement described above, a user with different TV sets in one residence is required to purchase separate set-top boxes for each TV set in order to be able to decode multiple pay-per-view channels simultaneously. Such an arrangement leads to an increased expenditure. Furthermore, tracking usage via this system is only possible through the cable operator, and therefore the user has no local control over account billing.

With the growing demand for digital signal inputs to individual households for items such as MP3 encoded audio and digital pay per view, a system is needed to provide these multiple needs simultaneously and conveniently.

SUMMARY OF THE INVENTION

In accordance with one embodiment of the present invention an in home pay-per-use system is provided wherein all requests by various users for a given pay per use function are controlled in-house by a source node that controls the use and availability of the data stream information for its connected end user nodes, simultaneously and independently

of each other. The end user nodes may include a plurality of various user applications, such as television sets, video recorders, audio devices, and personal computers.

The source node is connected to at least one end user node via a serial bus in accordance with a communication protocol such as those governed by IEEE1394 or Universal Serial Bus (USB) standards. It not only independently controls the end user's ability to decode the information contained in the data stream on the serial bus, but also maintains tracking, with accounting of all of the transactions that occur at each end user node.

The digital information contained in the data stream is transmitted in an encrypted format from a signal source, such as a cable operator, to the source node located locally in the end user's house and in turn is directed through multiple end user nodes each of which receives the entire encrypted data stream. Alternatively, digital information could be retrieved locally from a digital storage media such as a DVD, CD or any other means of storing digital information. When an end user requests a pay per use function, the end user node sends a key request to the source node via the serial bus. The source node then processes the information and returns a specifically addressed decryption key reply to the requesting end user node. That end user node employs the received decryption key to decode the requested information from the incoming data stream.

The accounting and decoding key requests are all handled locally as opposed to a distant central location. This allows users to have better control of various settings offered by the system, such as for example setting limits on use per user node, selecting appropriate content for each user node and the like. Additionally, because all of the accounting takes place locally, users can have access to more up-to-date billing information.

More importantly, another novel aspect of this invention is the ability to service many separate end user nodes on a serial bus simultaneously, while providing each with separate information and accounting. End use nodes may include various equipment, such as televisions, MP3 recorders, internet related devices, and other such equipment that is able to process digital media signals.

Other features of the system of the present invention will become apparent from the following detailed description.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 illustrates a block diagram of a local area pay-per-use system in accordance with one embodiment of the present invention.

Fig. 2 illustrates an exemplary end user database table, in accordance with one embodiment of the present invention.

Fig. 3 illustrates an exemplary accounting module, in accordance with one embodiment of the present invention.

Fig. 4 illustrates a flow diagram of the local area pay-per-use system's basic operation, in accordance with one embodiment of the present invention..

Fig. 5 illustrates an example of a local area pay-per-use system in a single billing home environment, in accordance with one embodiment of the present invention.

Fig. 6 illustrates an example of a local area pay-per-use system in a multiple billing party apartment building, in accordance with one embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 shows a local area pay-per-use system 10 containing a source node 20 and end user nodes 30, 30a to 30n. In accordance with one embodiment of this invention source node 20 comprises several internal components including a microprocessor 21, a memory module 22, an end user table 23, a decryption key module 24, an accounting module 40, and a bus interface 25. Microprocessor 21 is in two-way communication with all of the other internal components of source node 20 by way of an address and data bus 26. It is noted that the invention is not limited in scope to the embodiment described here. For example, various components illustrated in Fig.1 can be implemented in either hardware or software arrangements or a combination of both.

Furthermore it should be appreciated that although accounting module 40 appears within source node 20 in Fig.1, this is simply one possible location. Accounting module 40 could be placed at any location in a hardware or software format within local area pay-per-use system 10, provided it is in two-way communication with source node 20.

The connection of source node 20 to end user node 30 by way of serial bus 50, continues on to further link an additional plurality of end user nodes 30 through 30n all in serial connection to source node 20 by way of serial bus 50, as depicted in Fig 1. The actual number of end user nodes 30 that can be connected to source node 20 across serial bus 50 is limited only by the processing capabilities of the protocol used by serial bus 50.

Source node 20 is controlled by microprocessor 21. Memory module 22 stores encoded information from a signal source 60 that provides program contents such as digital media to source node 20 via a line feed 61. Alternatively, a digital media storage device 63 in

source node 20, is configured to store program contents so as to also provide media data to end user nodes 30. This information may be then forwarded, upon request, to the end user nodes. Line feed 61 or digital storage media device 63 can also be directly connected to bus interface 25, bypassing address and data bus 26.

End user table 23 maintains a list of end user nodes 30-30n along with the relevant information necessary for selectively addressing any one end user node 30. All relevant hardware and software components of each end user node are configured to be addressable. To this end, source node 20 is configured to store each end user node's memory map to directly address corresponding components of each end user node.

A possible data structure for end user table 23 can be seen in Fig. 2, where end user table entries include information fields relating to each end user name, ID, password, user type, memory map, and user preferences, although the invention is not limited in scope in this respect. The end user name field contains the name of a given end user node 30. The end user ID field contains a number identifying an address of a particular end user node 30. The end user password field contains the password for accessing control from that particular end user node 30, so that source node 20 could verify authorization before transmitting the decoding key. The end user type field stores information that allows source node 20 to identify the type of device that operates at end user node 30, such as a television or a MP3 formatted digital audio recorder. The end user memory map field stores the specific locations of all the hardware and software in a particular end user node 30, so that each hardware or software component of each end user node 30 can be specifically addressed by source node 20. Finally, the end user preference field includes information relating to some of the user preferences as to types of selections, channel blocking information and other related material concerning the regular use of end user node 30.

Decryption key module 24 of source node 20 stores the decoding keys for various pay-per-use functions so that source node 20 can control the use of all pay-per-use functions directly from local area pay-per-use system 10.

Bus Interface 25 of source node 20 coordinates information from microprocessor 21 in conjunction with information from the other modules and tables and subsequently places information into the proper protocols such as IEEE 1394 or Universal Serial Bus (USB) for information transfer along serial bus 50, such that source node 20 and each end user node 30 can be in communication with each other.

Accounting module 40 of source node 20 is configured to keep track of the individual uses by each end user node 30. Accounting module 40 is capable not only of

tracking use of pay-per-use functions per end user node 30, but is also capable to track the usage of various individuals with separate IDs, who use the same end user node with separate accounting arrangements.

Accounting module 40, as seen in Fig. 3, might comprise several fields including, program content field, end user node field, time field, rate field, ID field, and an end user's usage information field. The program content field stores information that allows keeping track of the type of programs being used by a particular ID or end user node 30. End user field stores information that allows keeping track of all of the particular uses of a pay-per-use function by a given end user node 30 over a desired time frame as specified by an end user. Similarly, the ID field contains information that allows keeping track of all of the particular uses of a pay-per-use function by a given ID over a given time frame. The time field contains information that allows keeping track of the time a particular pay-per-use function was used in the case of a pay-per-use function that is sold at a different rate at different times. The rate field stores information that allows keeping track of the various rates for different types of pay-per-use functions. And finally, the end user usage information field stores information that is used to allow a user with an ID or a particular end user node, to ascertain billing information from local area pay-per-use system 10 as frequently as so desired by the user.

Referring back to Fig. 1 an end user node 30 is comprised of several internal components including an end user node microprocessor 31, an end user node memory module 32, an end user node user interface 33, and an end user node bus interface 34. All of these internal components of end user node 30 are in two-way communication with each other by way of end user node address and data bus 35. Additionally, end user node 30 is in two-way communication with source node 20 across serial bus 50. Bus interface 25 and end user node bus interface 34 control this communication across serial bus 50.

End user node microprocessor 31 controls the pay-per-use functions of end user node 30. In addition to coordinating the internal components of end user node 30 it also coordinates billing and information reception from source node 20 via end user node bus interface 34, serial bus 50 and serial bus interface 25. End user memory module 32 stores information so that end user node 30 can be programmed to take future action. Additionally, end user node memory module 32 can also be used to store certain user's profile information, such as ID and password if necessary, program preferences, and other similar types of information. End user node user interface 33 can be any one of many various means by which a user can interact with end user node 30 and local area pay-per-use system 10. An

example of this would be a LCD screen attached somewhere on end user node 30. Another example is the arrangement where end user node 30 has its own display, such as a television set or computer. In such circumstances, end user node user interface 33 could simply appear as a display screen querying the user for the necessary information to begin the pay-per-use function.

During operation source node 20 continuously transmits an encoded signal stream to all end user nodes 30-30n. Each end user node 30 decodes a desired program content which is present in the transmitted signal stream, as selected by an end user. To this end, as illustrated in Fig. 4, pay-per use system 10, begins operation at step 200 where the user inputs the request for a pay-per-use function via interface 33 (this and all subsequent elements described in this operation method are in reference to Fig.1 unless otherwise stated) found on any one of end user nodes 30 through 30n. Next, at step 205, end user node microprocessor 31 processes the request signal and sends it to end user node bus interface 34. At step 210, end user node bus interface 34, in turn, provides the request signal with the proper protocol for serial bus 50 and then transmits the signal to source node 20. At step 215, bus interface 25 of source node 20 receives the information and relays it to microprocessor 21 for processing of the pay-per-use request.

At step 220, microprocessor 21 reviews the request against end user table 23 to determine if the proper information was received for processing of the request. Additionally, end user table 23 provides microprocessor 21 with the proper addressing information for the requesting end user node 30. At step 225, microprocessor 21 accesses the correct decryption key from decryption key module 24 and delivers it to bus interface 25 for specifically addressed delivery to the requesting end user node 30. At step 230, the microprocessor, utilizing the end user memory map from end user table 23, sends the specifically addressed decryption key signal to the requesting end user node 30. As such only end user nodes 30 of pay-per-use system 10 that have the appropriate decryption key can decode the corresponding program content present in the digital data stream transmitted via serial bus 50. At step 235, microprocessor 21 completes its function by sending the proper information to accounting module 40.

Finally, at step 240, end user node bus interface 34 receives the decoding key signal and sends it to end user node microprocessor 31. This allows end user node 30 to decode the desired information contained within the information stream in the serial bus without interfering with the operation of the other end user nodes 30 through 30n in local

area pay-per-use system10. It is noted that there are many variations to different portions of local area pay-per-use system 10 that define several other embodiments of this invention.

As contemplated in one embodiment of this invention local area pay-per-use system 10 is used in conjunction with a single family dwelling, with a single billing statement, seen in Fig. 5. In this situation local area pay-per-use system 10 is used to supplement a basic cable television service. Line feed 61 carrying a cable television or multimedia signal enters source node 20 and is dispensed about local area -pay-per-use system 10 via bus interface 25 and serial bus 50, such that end user nodes 30 through 30x are in constant receipt of the cable signal. In this configuration, each of the end user nodes 30 through 30x are individually capable of ordering a pay-per use function independently and simultaneously from each other with only one source node 20 for the entire house. As such, source node 20 replaces all of the set-top boxes employed in the traditional cable transmission system, allowing end users to use a pay-per-use function at different end user nodes 30 through 30n simultaneously, while accounting module 40 of source node 20 keeps track of the billing.

Additionally, as different in home pay per use functions appear on the market, this same configuration can allow not only multiple pay-per-view functions to be used, but also it allows many different types of media to be ordered such as digital audio signals in MP3 format and personal computer functions such as software downloads and other related internet functions. In the same way as above, as each function is ordered, source node 20 sends the decryption key to end user node 30 allowing the pay-per-use function to proceed while tracking the billing and usage time in accounting module 40.

In another embodiment of the present invention, local area pay-per-use system 10 can also be used in an apartment building or other multiple billing party arrangement as seen in Fig. 6. This configuration works in a similar fashion however, in this case source node 20 treats each individual end user node 30 as a separate billing party, simply reporting the uses of each end user node 30 to accounting module 40. Here each end user node 30 can be in a different apartment but they can all use the same source node 20 for decryption key requests and accounting of their pay-per-use functions. This allows for much greater ease in setting up new users on a pay-per-use system. This is an advantage over the prior-art because as tenants move in and out of apartments there is no need to deal with set-top boxes for each user, the new tenant can be simply added to end user table 23 and given an ID and password to enter into their end user node user interface 33. These modifications along with some adjustments to accounting module 40 can be done by the service provider over line feed 60

without requiring the user to purchase or rent a new set-top box. The number of end user nodes 30 is limited only by serial bus's 50 protocol. Additional end user nodes 30 can be done as easily as Plug and Play (TM) or other such hardware recognition programs. The configuration of end user node 30 will happen automatically, governed by the protocol of serial bus 50.

Another embodiment contemplated by this invention is a set up with multiple end user nodes 30 through 30n where each end user node 30 is used by any one of a number of different users. As described above, each user is deemed as a separate billing party and the end user nodes 30-30n are in operation simultaneously, performing various pay-per-use functions. Typically, this arrangement employs for example, when different members of a household desire to track their usage of various devices in their pay-per-use system 10. As such, each member is assigned a separate ID and access code for the sam pay-per-use device.

It is also noted that the local area pay-per-use-system10 described herein can operate without decryption technology as well, in accordance with another embodiment of the invention. For example the signal stream via serial bus 50, may be transmitted without being encoded. As such, all the program contents available in the signal stream are accessible by each one of end user nodes 30-30n. For this arrangement the use by each end user node 30 is tracked when a user requests a desired program content. In response, the desired program contents are decoded by end user node 30 without the need for any decoding keys. All the information content will then be available to all end user nodes 30. Decoding is controlled only by the device. For example, an MP3 player will not decode a digital video signal and vise versa.

One of the advantages of local area pay-per-use system 10 as described above is the ability of source node 20 to simultaneously manage and account for many pay-per-use functions at multiple end user nodes 30 without requiring an individual set-top box at each device. Whether this be in the form of several devices in a single house, or one or two devices in many apartments, or even multiple public ports at a internet café or digital video arcade, local area pay-per use system 10 allows a single source node 20 to control the use and accounting for multiple pay-per-use functions simultaneously.

CLAIMS:

1.

A local area pay-per-use system (10) comprising:

- at least one user node (30) coupled together via a local network, each said user node (30) configured to receive a program content selectable from a menu of said program contents;
- a source node (20) coupled to said at least one user node (30), said source node (20) configured to provide said plurality of selectable program contents contained within a signal stream transmitted to each of said user nodes (30); and
- an accounting module (40) coupled to said local area pay-per-use system (10), configured to track usage of said selectable program contents by each one of said user nodes.

2. A local area pay-per-use system in accordance with claim 1, wherein said user node is one of a televison, a personal computer, an MP3 format digital audio recorder, and a digital video arcade.

3. A local area pay-per-use system in accordance with claim 1, further comprising a decoding key module (24) configured to store a plurality of decryption keys corresponding to each one of said program contents contained in said transmitted signal stream.

4. A local area pay-per-use system in accordance with claim 1, wherein said program content is pay-per-view video signal.

5. A local area pay-per-use system in accordance with claim 1, further comprising

an end user table (23) configured to store information related to said end user nodes.

6. A local area pay-per-use system in accordance with claim 5, wherein said end user table further comprises a memory map of end user table information field which stores said information related to said end user nodes.

7. A local area pay-per-use system in accordance with claim 5, wherein said plurality of end user table information fields comprise at least one of a name field, an ID field, a password field, a user type field, a memory map field and a user preference field.

8. A local area pay-per-use system in accordance with claim 1, wherein said accounting module is configured to track pay-per-use selectable program contents usage for at least one of a plurality of subscription types.

9. A local area pay-per-use system in accordance with claim 1, further comprising a serial bus (50) with serail bus interfaces (25,34) in said source node and said end user nodes, wherein said serial bus is configured to carry said signal stream between said end user nodes and said source node.

10. A local area pay per use system in accordance with claim 9, wherein said serial bus uses at least one of serial bus protocols IEEE 1394 and Universal Serial Bus (USB).

11. A local area pay per use system in accordance with claim 1, further comprising a digital media storage device (63) configured to store and supply said selectable program contents to said source node for distribution to said end user nodes of said local are pay-per-use system.

12. A method for providing a local area pay-per-use system (10) having a plurality of user nodes (30), a source node (20) and an accounting module (40) said method comprising the steps of:

- transmitting to said user nodes (30) a plurality of selectable program contents contained in a signal stream;
- receiving from at least one of plurality of said end user nodes (30) a request signal for one of said plurality of selectable program contents (215);
- delivering a decryption key (230) to a requesting said end user node (30); and

tracking each of said pay-per-use transactions (235) by said accounting module (40).

13. The method according to claim 12, further comprising the step of encoding said selectable program contents.

14. The method according to claim 12, further comprising the step of responding to said request signal by sending a decryption key.

15. The method according to claim12, further comprising the step of including in said selectable program content at least one of a pay-per-view video signal, a cable televison signal, a personal computer download signal, an MP3 format digital audio signal, and a digital video arcade signal.

16. The method according to claim 12, further comprising the step of receiving said request signal by said source node via serial bus interface (25).

17. The method according to claim 12, further comprising the step of storing map information relating to each of said end user nodes as end user table memory.

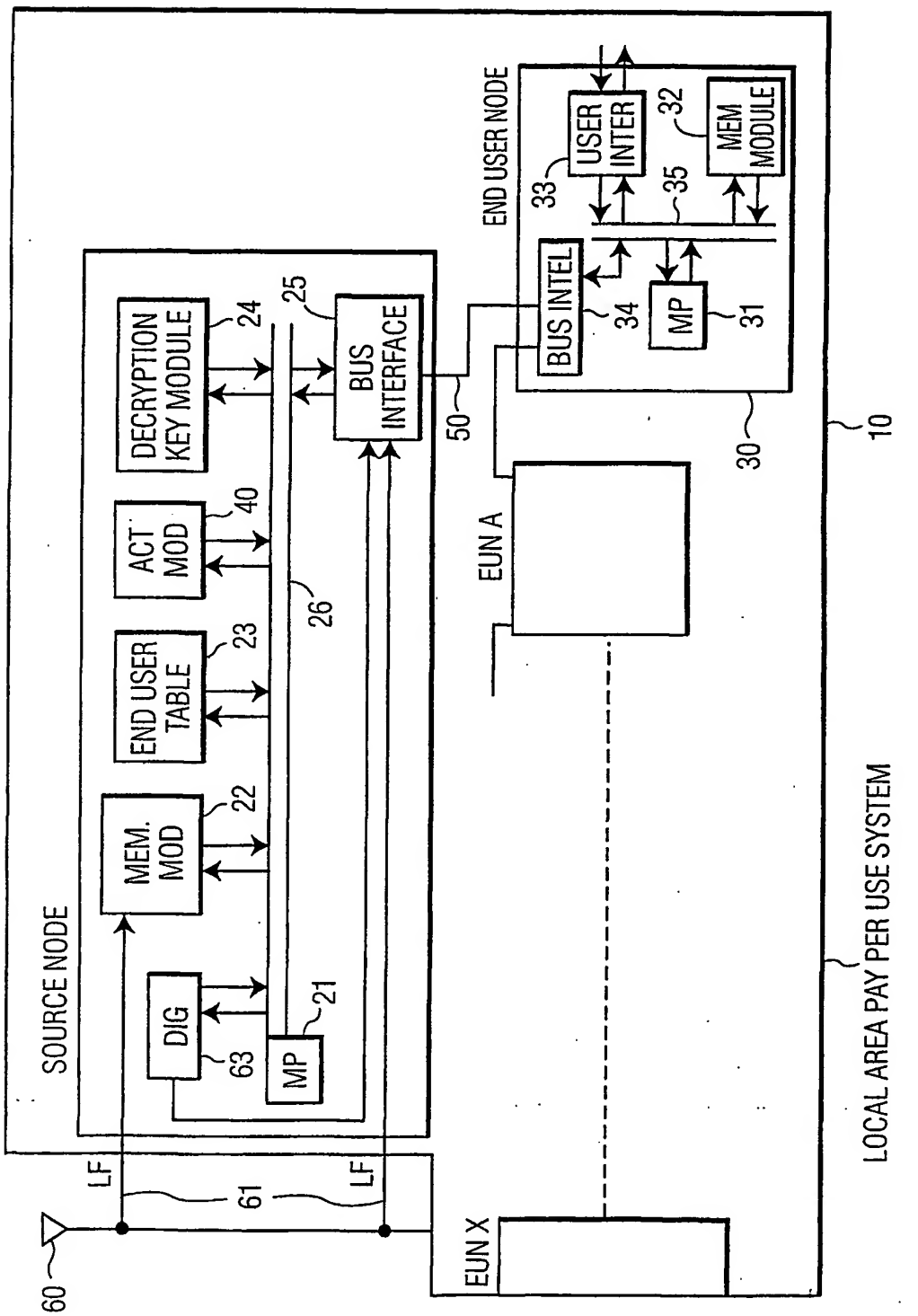
LOCAL AREA PAY PER USE SYSTEM
10
SOURCE NODE
DECRYPTION KEY MODULE
24
BUS INTERFACE
25
ACT MOD
40
END USER TABLE
23
MEM. MOD
22
DIG
63
MP
21
26
LF
61
LF
60
50
END USER NODE
BUS INTEL
34
MP
31
30
USER INTER
33
MEM MODULE
32
35
EUN A
EUN X

FIG. 1

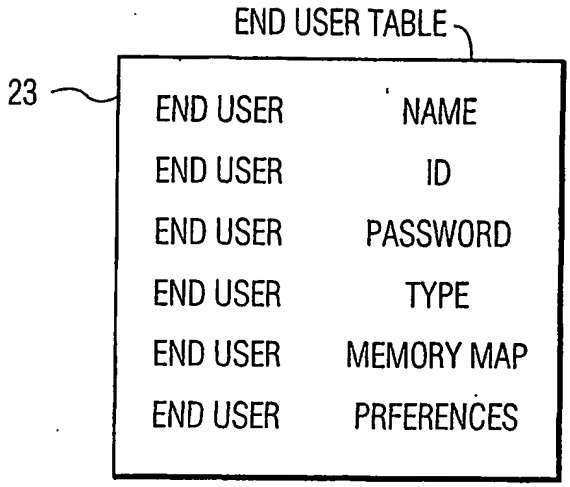
END USER TABLE
23
END USER NAME
END USER ID
END USER PASSWORD
END USER TYPE
END USER MEMORY MAP
END USER PRFERENCES

FIG. 2

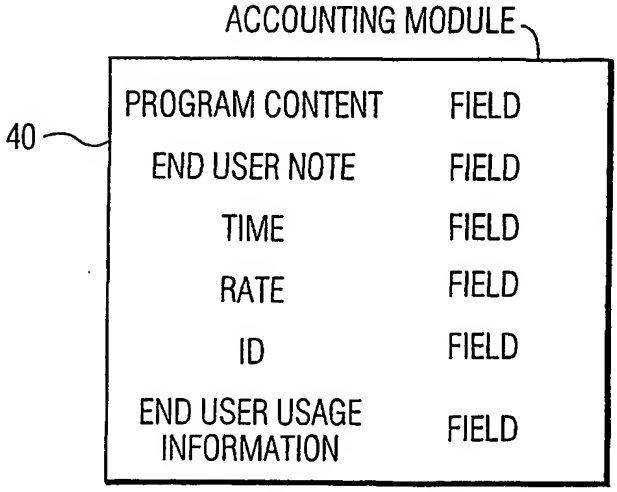
ACCOUNTING MODULE
40
PROGRAM CONTENT FIELD
END USER NOTE FIELD
TIME FIELD
RATE FIELD
ID FIELD
END USER USAGE INFORMATION FIELD

FIG. 3

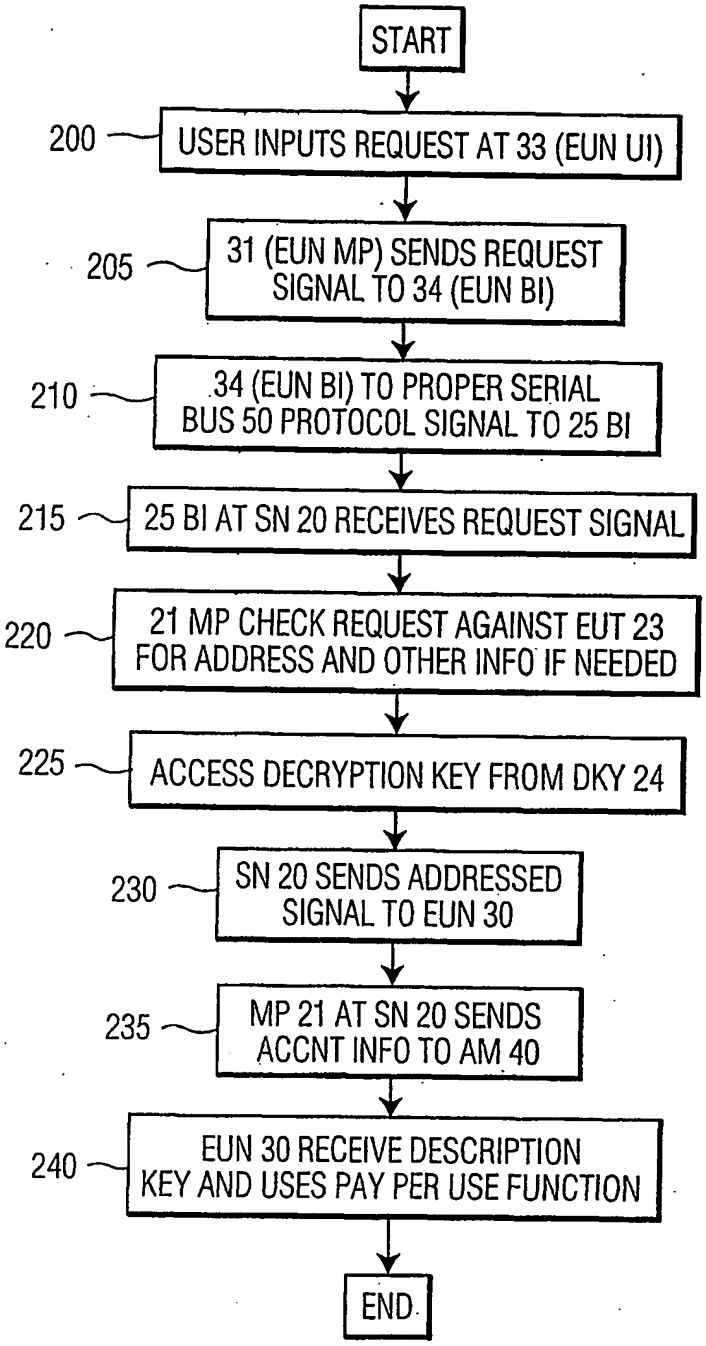
START
200
USER INPUTS REQUEST AT 33 (EUN UI)
205
31 (EUN MP) SENDS REQUEST SIGNAL TO 34 (EUN BI)
210
34 (EUN BI) TO PROPER SERIAL BUS 50 PROTOCOL SIGNAL TO 25 BI
215
25 BI AT SN 20 RECEIVES REQUEST SIGNAL
220
21 MP CHECK REQUEST AGAINST EUT 23 FOR ADDRESS AND OTHER INFO IF NEEDED
225
ACCESS DECRYPTION KEY FROM DKY 24
230
SN 20 SENDS ADDRESSED SIGNAL TO EUN 30
235
MP 21 AT SN 20 SENDS ACCNT INFO TO AM 40
240
EUN 30 RECEIVE DESCRIPTION KEY AND USES PAY PER USE FUNCTION
END

FIG. 4

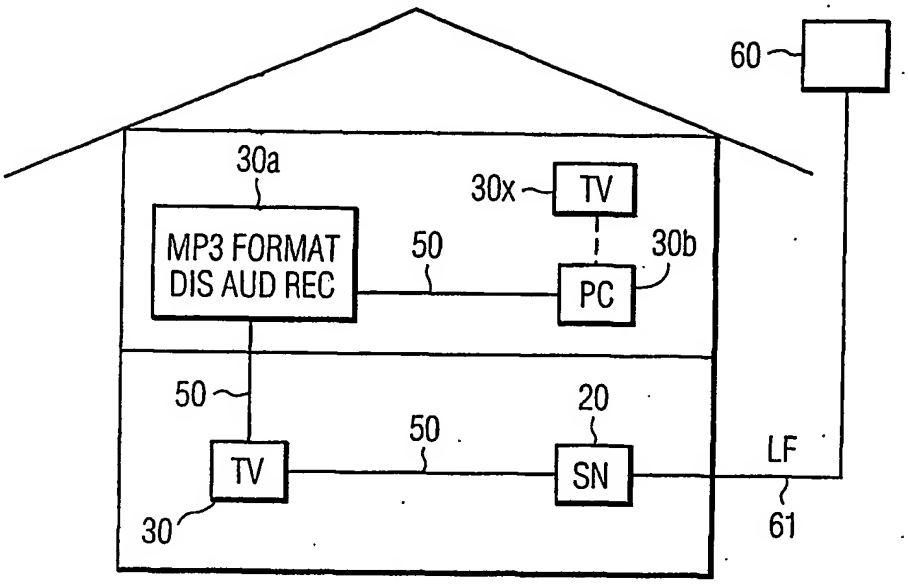
60
30a
30x
TV
MP3 FORMAT
DIS AUD REC
50
30b
PC
50
20
50
TV
SN
LF
30
61

FIG. 5

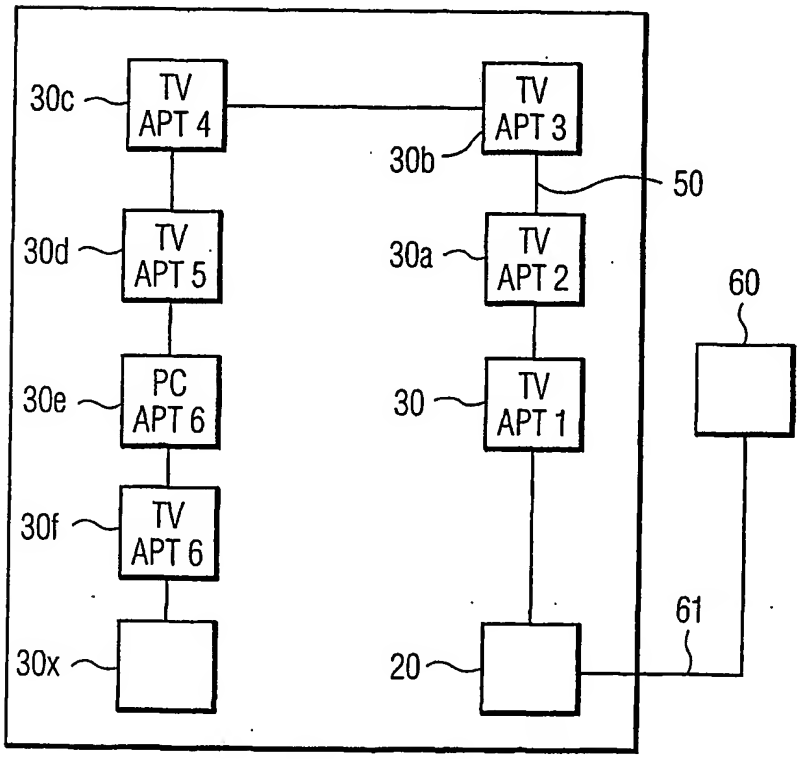
30c
TV
APT 4
TV
APT 3
30b
50
30d
TV
APT 5
30a
TV
APT 2
60
30e
PC
APT 6
30
TV
APT 1
30f
TV
APT 6
61
30x
20

FIG. 6

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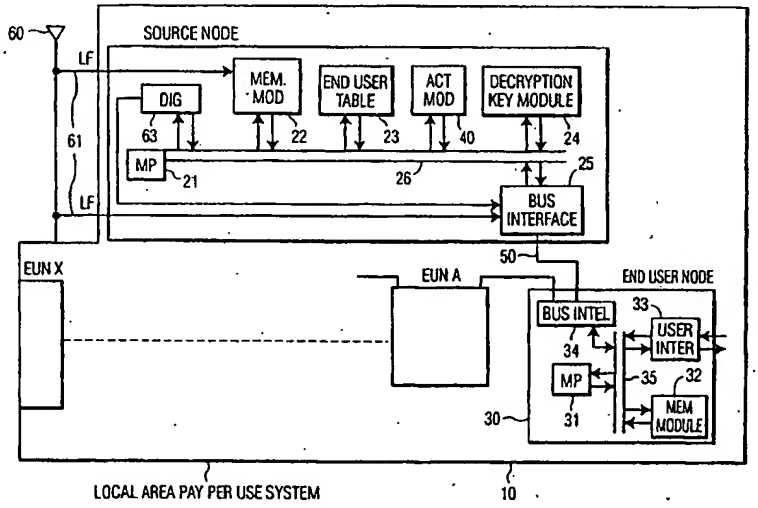
(54) Title: A PAY-PER USE SYSTEM OVER A SERIAL BUS



(57) Abstract: A local area pay-per-use system comprises user nodes coupled together via a local network, each user node receiving a program content selectable from a menu of program contents. A source node is coupled to said user nodes to provide the selectable program contents contained within a signal stream transmitted to each of the user nodes. An accounting module is coupled to the local area pay-per-use system, and is configured to track usage of the selectable program contents by each one of the user nodes. The user nodes include a variety of media systems, such as a televison, a personal computer, an MP3 format digital audio recorder, and a digital video arcade, and the like. Furthermore, a decoding key module is configured to store a plurality of decryption keys corresponding to each one of the program contents contained in the transmitted signal stream, and is provided to a user node upon request.

WO 02/11447 A3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP 01/08351

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04N7/10 H04N5/00 H04N7/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	WO 00 08854 A (JEFFREY ROSS A) 17 February 2000 (2000-02-17) page 4, line 21 -page 9, line 15 page 10, line 14 -page 11, line 11 page 13, line 1 -page 4 page 15, line 25 -page 16, line 27 page 17, line 20 -page 18, line 3 figures 1-3 ---	1,2,4,5, 8,11 3,7,9, 10,12-16
Y	EP 1 014 701 A (SONY CORP) 28 June 2000 (2000-06-28) page 3, column 38, line 7 -page 31 figures 3,4,8-10 --- -/--	3,7,9, 10,12-16

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 February 2002	05/03/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Van der Zaal, R

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"FUNCTIONAL MODEL OF A CONDITIONAL ACCESS SYSTEM" EBU REVIEW- TECHNICAL, EUROPEAN BROADCASTING UNION. BRUSSELS, BE, no. 266, 21 December 1995 (1995-12-21), pages 64-77, XP000559450 ISSN: 0251-0936	

INTERNATIONAL SEARCH REPORT

Information on patent family members

Ir. ational Application No
PCT/EP 01/08351

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		EP	1014701 A2	28-06-2000